What is claimed is:

1. A high speed spectral measurement system comprising at least one light source, an illumination acousto-optic tunable filter (AOTF) configured to receive light from the light source and to selectively transmit substantially only illumination light in a desired illumination wavelength range to a sample, and a detector disposed to detect emission light emanating from the sample, wherein at least the illumination AOTF and the detector are operably connected to a computer that controls the illumination AOTF and the detector and integrates data regarding the illumination AOTF and the detector.

2. The spectroscopy system of claim 1 wherein the system further comprises a detection AOTF configured to receive emission light from the sample and to selectively transmit to the detector substantially only light in a desired detection wavelength range.

3. The spectroscopy system of claim 2 wherein the desired detection wavelength range comprises emission light from fluorophores excited by the fluorescence excitation light.

4. The spectroscopy system of claim 2 wherein the detector is a photomultiplier detector.

5. The spectroscopy system of claim 2 wherein the computer is configured to vary the desired illumination wavelength range of the illumination AOTF to provide a desired fluorescence excitation light and is configured to vary the desired detection wavelength range of the detection AOTF to detect fluorescent light from fluorophores excited by the desired fluorescence excitation light.

6. The spectroscopy system of claim 1 wherein the system further comprises a second illumination AOTF downstream from the first illumination AOTF and operably connected to the computer to work in series with the first illumination AOTF to provide almost complete out of band rejection of undesired light.

7. The spectroscopy system of claim 6 wherein the out of band rejection is better than at least about 10-6.

8. The spectroscopy system of claim 2 wherein the system further comprises a second detection AOTF downstream from the first detection AOTF and operably connected to the computer to work in series with the first detection AOTF to provide almost complete out of band rejection of undesired light.

9. The spectroscopy system of claim 8 wherein the system further comprises a second detection AOTF downstream from the first detection AOTF and operably connected to the computer to work in series with the first detection AOTF to provide almost complete out of band rejection of undesired light.

10. The spectroscopy system of claim 9 wherein the out of band rejection is better than at least about 10-6.

11. The spectroscopy system of claim 2 or 4 wherein the system further comprises an illumination light guide disposed to transmit the illumination light from the illumination AOTF to the sample and a detection light guide disposed to transmit the detection light from the sample to the detection AOTF.

12. The spectroscopy system of claim 11 wherein the illumination light guide and the detection light guide are flexible light guide bundles each comprising a plurality of optical fibers.

13. The spectroscopy system of claim 11 wherein the illumination light guide and the detection light guide are configured to form a bifurcated light guide wherein the illumination light guide provides an illumination branch and the detection light guide provides a pick-up branch that combine to form a common end.

14. The spectroscopy system of claim 12 wherein the illumination light guide and the detection light guide are configured to form a bifurcated light guide wherein the illumination light guide provides an illumination branch and the detection light guide provides a pick-up branch of the bifurcated light guide that combine to form a common end.

15. The spectroscopy system of claim 14 wherein the bifurcated light guide is configured to non-invasively interrogate skin.

16. The spectroscopy system of claim 1 or 2 wherein the system is configured such that the desired illumination wavelength range is less than about 5 nm.

17. The spectroscopy system of claim 1 or 2 wherein the system is configured such that the desired illumination wavelength range is less than about 1 nm FWHM.

18. The spectroscopy system of claim 1 or 2 wherein the system is configured such that the system can selectively excite and selectively detect long wavelength VIS-induced and NIR-induced fluorescence.

19. The spectroscopy system of claim 1 or 2 wherein the system is configured to access discrete wavelengths at rates of at least about 10 KHz.

20. The spectroscopy system of claim 1 or 2 wherein the system is configured to vary the illumination light from at least about 400 nm to 1000 nm.

21. A high speed excitation-emission matrix (EEM) spectroscopy system comprising at least one light source, an illumination acousto-optic tunable filter (AOTF) configured to receive light from the light source and to selectively transmit substantially only fluorescence excitation light in a desired illumination wavelength range to a sample, a detection AOTF configured to receive emission light from the sample and to selectively transmit to a detector substantially only light in a desired detection wavelength range that comprises emission light from fluorophores excited by the fluorescence excitation light, wherein at least the illumination AOTF, the detection AOTF and the detector are operably connected to a computer that controls the illumination AOTF, the detection AOTF and the detector and integrates data regarding the illumination AOTF, the detection AOTF and the detector to provide an EEM of the sample.

22. The spectroscopy system of claim 21 wherein the EEM is a 2-dimensional EEM.

23. The spectroscopy system of claim 21 wherein the EEM is a 3-dimensional EEM.

24. The spectroscopy system of claim 21 wherein the detector is a photomultiplier detector.

25. The spectroscopy system of claim 21 wherein the system is configured to operate at rates sufficient to obtain substantially complete data for an EEM from about 400 nm to 1000 nm at excitation wavelength steps separated by about 10 nm in less than about 3 seconds.

26. The spectroscopy system of claim 21 wherein the system is configured to operate at rates sufficient to obtain substantially complete data for an EEM from about 400 nm to 1000 nm at excitation wavelength steps separated by about 10 nm in less than about 0.9 seconds.

27. The spectroscopy system of claim 21 wherein the system is configured to operate at rates sufficient to obtain substantially complete data for an EEM from about 400 nm to 1000 nm at excitation wavelength steps separated by about 10 nm in less than about 30 ms.

28. The spectroscopy system of claim 21 wherein the system is configured to operate at rates sufficient to obtain substantially complete data for an EEM from about 400 nm to 1000 nm at excitation wavelength steps separated by about 10 nm in less than about 15 ms.

29. The spectroscopy system of claim 21 wherein the system further comprises a second illumination AOTF downstream from the first illumination AOTF and operably connected to the computer to work in series with the first illumination AOTF to provide almost complete out of band rejection of undesired light, and a second detection AOTF downstream from the first detection AOTF and operably connected to the computer to work in series with the first detection AOTF to provide almost complete out of band rejection of undesired light.

30. The spectroscopy system of claim 29 wherein the out of band rejection is better than at least about 10-6.

31. The spectroscopy system of claim 21 wherein the system further comprises an illumination light guide disposed to transmit the illumination light from the illumination AOTF to the sample and a detection light guide disposed to transmit the detection light from the sample to the detection AOTF.

32. The spectroscopy system of claim 29 wherein the system further comprises an illumination light guide disposed to transmit the illumination light from the illumination AOTF to the sample and a detection light guide disposed to transmit the detection light from the sample to the detection AOTF.

33. The spectroscopy system of claim 31 or 32 wherein the illumination light guide and the detection light guide are flexible light guide bundles each comprising a plurality of optical fibers.

34. The spectroscopy system of claim 31 wherein the illumination light guide and the detection light guide are configured to form a bifurcated light guide wherein the illumination light guide provides an illumination branch and the detection light guide provides a pick-up branch that combine to form a common end.

35. The spectroscopy system of claim 32 wherein the illumination light guide and the detection light guide are configured to form a bifurcated light guide wherein the illumination light guide provides an illumination branch and the detection light guide provides a pick-up branch that combine to form a common end.

36. The spectroscopy system of claim 33 wherein the illumination light guide and the detection light guide are configured to form a bifurcated light guide wherein the illumination light guide provides an illumination branch and the detection light guide provides a pick-up branch of the bifurcated light guide that combine to form a common end.

37. The spectroscopy system of claim 36 wherein the bifurcated light guide is configured to non-invasively interrogate skin.

38. The spectroscopy system of claim 21 wherein the system is configured such that the desired illumination wavelength range is less than about 5 nm.

39. The spectroscopy system of claim 21 wherein the system is configured such that the desired illumination wavelength range is less than about 1 nm FWHM.

40. The spectroscopy system of claim 21 wherein the system is configured such that the system can selectively excite and selectively detect long wavelength VIS-induced fluorescence and NIR-induced fluorescence.

41. The spectroscopy system of claim 21 wherein the system is configured to access discrete wavelengths at rates of at least about 10 KHz.

42. The spectroscopy system of claim 21 wherein the system is configured to vary the illumination light from at least about 400 nm to 1000 nm.

43. A method of detecting autofluorescence in a sample comprising:

Illuminating the sample with at least one of a long wavelength VIS and NIR excitation light filtered through at least one acousto-optic tunable filter (AOTF), and

detecting via a detector fluorescence emission light emanating from the sample.

44. The method of claim 43 wherein the method is computer implemented.

45. The method of claim 44 wherein the method further comprises analyzing the emission light and determining therefrom at least one characteristic about melanin in the sample.

46. The method of claim 44 wherein the method further comprises filtering the fluorescence emanation light through a detection AOTF upstream from the detector.

47. The method of claim 44 wherein the method further comprises amplifying the fluorescence emanation light via an amplifier downstream from the detector.

48. The method of claim 44 wherein the detector is a photomultiplier detector.

49. The method of claim 44 wherein the computer varies the desired illumination wavelength range of the illumination AOTF to provide a desired fluorescence excitation light and varies the desired detection wavelength range of the detection AOTF to detect fluorescent light from fluorophores excited by the desired fluorescence excitation light.

50. The method of claim 49 wherein the method further comprises filtering the emission light through a second detection AOTF downstream from the first detection AOTF and operably connected to the computer to work in series with the first detection AOTF, to provide almost complete out of band rejection of undesired light.

51. The method of claim 44 or 50 wherein the method further comprises filtering the illumination light through a second illumination AOTF downstream from the first illumination AOTF and operably connected to the computer to work in series with the first illumination AOTF, to provide almost complete out of band rejection of undesired light.

52. The method of claim 44 wherein the method further comprises transmitting the illumination light through an illumination light guide disposed to transmit the illumination light from the illumination AOTF to the sample and transmitting the fluorescence emission light through a detection light guide disposed to transmit the fluorescence emission light from the sample to the detection AOTF, wherein the illumination light guide and the detection light guide are configured to form a bifurcated light guide wherein the illumination light guide provides an illumination branch and the detection light guide provides a pick-up branch that combine to form a common end.

53. The method of claim 52 wherein the bifurcated light guide is configured to non-invasively interrogate skin and the method further comprises non-invasively interrogating skin.

54. The method of claim 44 wherein the method is configured such that the desired illumination wavelength range is less than about 5 nm.

55. The method of claim 44 wherein the method is configured such that the desired illumination wavelength range is less than about 1 nm FWHM.

56. The method of claim 44 wherein the method is configured such that the system can selectively excite and selectively detect long wavelength VIS-induced and NIR-induced fluorescence.

57. The method of claim 44 wherein the method further comprises accessing discrete wavelengths at rates of at least about 10 KHz.

58. The method of claim 44 wherein the method further comprises varying the illumination light from at least about 400 nm to 1000 nm.

59. The method of claim 44 wherein the method further comprises creating an excitation-emission matrix (EEM) depicting the fluorescence emission light emanating from the sample.

60. The method of claim 44 wherein the EEM is a 2-dimensional EEM.

61. The method of claim 44 wherein the EEM is a 3-dimensional EEM.

62. A method of analyzing melanin in a sample comprising:

a) illuminating the sample with excitation light comprising at least one of long wavelength visible (VIS) and near infrared (NIR) light;

b) inducing autofluorescence from the melanin due to the excitation light; and,

c) measuring the autofluorescence and therefrom analyzing at least one characteristic of the melanin.

63. The method of claim 62 wherein the excitation light consists essentially of long wavelength visible (VIS) and near infrared (NIR) light.

64. The method of claim 62 or 63 wherein the long wavelength visible (VIS) and near infrared (NIR) light consists essentially of 785 nm light.

65. The method of claim 62 or 63 wherein the autofluorescence is induced and measured in less than about 30 ms.

66. The method of claim 62 or 63 wherein the autofluorescence comprises a peak at about 880 nm - 900 nm and the analyzing comprises using the peak to identify the melanin.

67. The method of claim 62 or 63 wherein the method further comprises quantifying the amount of melanin in the sample.

68. The method of claim 62 wherein the autofluorescence is induced and measured using a system according to any one of claims 2, 6, 8, 9, 13 and 15.

69. The method of claim 62 wherein the autofluorescence is induced and measured using a system according to any one of claims 21, 24, 28, 31, 32, 37.

70. A method of rapidly detecting autofluorescence in a sample comprising:

scanning the sample with an about 5 nm wavelength band of excitation light, the scanning covering a wavelength range of at least about 200 nm of wavelengths of light and proceeding at a rate fast enough to covering at least about 600 nm of wavelengths in less than about 10 seconds, and

detecting through a filter configured to substantially block the excitation light fluorescence emission light emanating from the sample.

71 The method of claim 70 wherein the scanning covers at least about 600 nm of wavelengths and proceeds at a rate fast enough to scan the about 600 nm of wavelengths in less than about 1 seconds.

72. The method of claim 70 or 71 wherein the scanning proceeds at a rate fast enough to scan the about 600 nm of wavelengths in less than about 30 ms.

73. The method of claim 70 or 71 wherein the scanning proceeds at a rate fast enough to scan the about 600 nm of wavelengths in less than about 15 ms.

74. The method of claim 70 or 71 wherein the scanning covers a wavelength range consisting essentially from about 200 nm to about 1100 nm.

75. The method of claim 70 or 71 wherein the scanning covers a wavelength range comprising UV wavelengths.

76. The method of claim 70 or 71 wherein the scanning covers a wavelength range comprising long wavelength visible (VIS) and near infrared (NIR) light.

77. The method of claim 70 or 71 wherein the wavelength band of excitation light has a width less than about 1 nm FWHM.

78. The method of claim 70 wherein the method is computer implemented.

79. The method of claim 78 wherein the method further comprises passing the excitation light through at least one acousto-optic tunable filter (AOTF) upstream from the sample and the detecting comprises filtering the fluorescence emanation light through a detection AOTF upstream from the detector.

80. The method of claim 70 or 78 wherein the method further comprises amplifying the fluorescence emanation light via an amplifier downstream from the detector.

81. The method of claim 70 or 78 wherein the method further comprises filtering the emission light through a second detection AOTF downstream from the first detection AOTF and operably connected to the computer to work in series with the first detection AOTF, to provide almost complete out of band rejection of undesired light.

82. The method of claim 70 or 78 wherein the method further comprises transmitting the illumination light through an illumination light guide disposed to transmit the illumination light from the illumination AOTF to the sample and transmitting the fluorescence emission light through a detection light guide disposed to transmit the fluorescence emission light from the sample to the detection AOTF, wherein the illumination light guide and the detection light guide are configured to form a bifurcated light guide wherein the illumination light guide provides an illumination branch and the detection light guide provides a pick-up branch that combine to form a common end.

83. The method of claim 82 wherein the bifurcated light guide is configured to non-invasively interrogate skin and the method further comprises non-invasively interrogating skin.

84. The method of claim 70 or 78 wherein the method further comprises accessing discrete wavelengths at rates of at least about 10 KHz.

85. The method of claim 70 or 78 wherein the method further comprises creating an excitation-emission matrix (EEM) depicting the fluorescence emission light emanating from the sample.

86. A method of analyzing a sample for presence of cancer comprising:

a) illuminating the sample with excitation light comprising at least one of long wavelength visible (VIS) and near infrared (NIR) light;

b) inducing autofluorescence from cancerous portions in the sample, if any, due to the excitation light; and,

c) measuring the autofluorescence and therefrom analyzing at least one characteristic of the possible cancer.

87. The method of claim 86 wherein the excitation light consists essentially of long wavelength visible (VIS) and near infrared (NIR) light.

88. The method of claim 86 or 87 wherein the long wavelength visible (VIS) and near infrared (NIR) light consists essentially of about 785 nm light.

89. The method of claim 86 or 87 wherein the autofluorescence is induced and measured in less than about 30 ms.

90. The method of claim 86 wherein the autofluorescence is induced and measured using a system according to any one of claims 2, 6, 8, 9, 13 and 15.

91. The method of claim 86 wherein the autofluorescence is induced and measured using a system according to any one of claims 21, 24, 28, 31, 32, 37.